JFICMI Basic Critical Care Echocardiography (BCCE)

2017

Introduction

The "International expert statement on training standards for critical care ultrasonography" position paper published in Intensive Care Medicine 2011 set a standard that *"basic critical care echocardiography [basic CCE] should be mandatory in the curriculum of intensive care unit (ICU) physicians. It is the role of each critical care society to support the implementation of training in GCCUS and basic CCE in its own country".*

There are certain challenges around this, including the limited numbers of potential mentors and limited ICM modular training time. Over recent years there has been considerable expansion of TransThoracic ECHO performed by Intensivists in Ireland with an expansion therefore in the potential mentor base. In parallel with this there has been an expansion in availability of suitable Echo machines. Other jurisdictions have been presented with similar challenges and the FOCUSED INTENSIVE CARE ECHOCARDIOGRAPHY (FICE) addresses some of these. In particular, this JFICMI Education and Training Committee proposal has adopted the mentor solution of the FICE programme (see below). The level of competency to be achieved is derived from the CoBatrice Coba Echo domains.

The JFICMI shall provide for recognition of Basic CCE at defined training sites. Certification at such sites shall support the ability of a candidate to progress to advanced CCE training and accreditation, including the new ESICM EDEC accreditation process which has an entry requirement of certification in basic CCE, and hence an imperative the JFICMI develops such a programme.

Candidates:

- Candidates are registered JFICMI trainees
- Consultants with an Interest in Intensive Care Medicine
- Consultants in Intensive Care Medicine.

Course:

All candidates must attend a recognized Basic Echocardiography course within 12 months of first logbook entry. The JFICMI is happy to review and approve national and international basic CCE. This is usually a 2 day course with a combination of didactic lectures (approx. 10 hrs), clinical examples and hands on training with volunteers.

Hands-On Training:

Although sites may vary, hands-on training is likely to be modelled on a 6-months 2 hours/week "Hands-on" formal instruction (approx. 40hrs) and mentored personal experience over the same period.

Mentors and Supervisors:

Each approved basic CCE training site shall be able to provide Mentors for the candidates and Supervisors for both mentor and candidate.

(a) Mentor

- Shall have suitable experience and regular practice in Critical Care Echo.
- Where he/she does not hold a recognized certificate in cardiac echocardiography, shall have access to a supervisor for overview of the training provided and for review of difficult cases.

(b) Supervisor

- Shall have a recognized national or international accreditation in echocardiography.
- Shall have suitable experience and regular practice in critical care echo.
- Shall provide oversight, support and on-going training to both mentor and candidate (e.g. Peer review sessions).

Logbook

- Candidate must detail their basic CCE exams in a logbook (model format attached) and submit 30 cases for review by their Mentor.
- The logbook must be representative of the Image Acquisition and Interpretation > Knowledge domains as per Coba Echo (see below).
- The logbook should reflect some cases of RWMA, Valvular abnormality, pleural effusion, hypovolaemia etc, some of which may require a training relationship with other aspects of the hospital outside ICU depending on case-mix – e.g. Cardiac Echo Department / technicians, cardiology, cardiac theatres etc.

Exam

All candidates must complete a short exam to be devised by the JFICMI comprising MCQs and video-loops. This aspect of the training process shall be managed by the JFICMI to ensure consistency of training across sites. The fee shall be kept notional.

Basic Echocardiography Training Programme

Instrumentation

Knowledge

- Lecture 'How to optimize the standard Echo image' or 'Knobology' should incorporate enough physics to use any Echo machine.
- Infection control precautions
- Care of the ultrasound machine including cleaning (transducer head special cleaning agent etc.)

Skills

- Select appropriate ultrasound transducer
- Use conductive gel to aid transmission of ultrasound wave
- Correctly adjusts depth, gain and focus position
- Identifies common artifacts

Functional approach to Echocardiography training incorporating cognitive & technical training.

For example: Mater Misericordiae University Hospital (MMUH) Basic Echo Training over six months

Months 1-2:

- Reliably acquire standard views
- Recognise whether image is adequate or not
- Identify normal and abnormal findings
- Interprets Echo findings with respect to cardio-respiratory support at time of imaging (e.g. level of vasoactive medication, IABP)

Months 3-6:

Recognise the echocardiographic features of the following syndromes:

- LV global dysfunction including cardiomyopathies
- RV dilatation and dysfunction including including acute Cor Pulmonale (Pulmonary Embolism, ARDS)
- Regional Wall Motion Abnormalities (hypokinesis, akinesis)
- Hypovolaemia (IVC diameter and relationship with respiratory cycle spontaneous breathing and ventilator support. LV end-systolic cavitary obliteration)
- Pericardial Effusion including cardiac tamponade (RA & RV collapse)
- Recognise how to differentiate pericardial from pleural fluid
- Severe mitral regurgitation and severe aortic regurgitation

Additionally recognize:

- Severe calcification of the Aortic Valve
- Aortic dilatation or dissection flap in the ascending aorta

Incorporate findings with clinical picture and communicate findings:

- Start treatment, organize subsequent investigations and reassess impact of initial treatment
- Special situation: Relationship between conduct of peri-arrest Echo and the Advanced Life Support (ALS) Algorithm

Understand the indications for and limitations of Basic Echocardiography training and Transthoracic Echocardiography in general

- Some conditions better visualized using Transoesophageal Echocardiography e.g. Mitral Regurgitation due to Papillary muscle rupture, Aortic Pathology, poor image quality
- Indications for immediate expert assistance, subsequent comprehensive Echo accredited practitioner or need for alternative investigation
- Echocardiographic findings in PE usually indirect
- Finding of left sided Valvular Regurgitation, possible AS requires advanced TTE assessment

Patient Safety & Governance

Format of standard Echo report

- Importance of entering patient information, capturing images and uploading study to appropriate archiving system
- Need to quality assure Echo reports
- Relevance of Date Protection Act to image storage

References:

1. International expert statement on training standards for critical care ultrasonography. Expert Round Table on Ultrasound in ICU. Intensive Care Med (2011) 37:1077-1083
2. Focused Intensive Care Echocardiography (FICE) http://www.ics.ac.uk/ICS/fice.aspx
3. ESICM CoBatrice: http://www.esicm.org/education/cobatrice.

Basic Level

Critical Care Echocardiography

Log Book

Case Study #_____ Date of Study __/__/____ Images saved echo machine: _____

Age:____Weight: _____ HR /rhythm:_____BP:_____ CVP:_____ Lactate: ___mmol/L

Indication:_____

Clinical History:_____

Vasoactive Medications:_____

Settings: Mechanical Ventilation _____CPAP_____BiPaP_____

Windows: PLAX ☐ PSAX ☐ APICAL 4-C ☐ SubCostal ☐

(Grade image quality per window: Good = 1; Adequate = 2; Poor = 3)

Chambers

Left Ventricle (LV):

LV visually dilated: Y/N LVEDd_____mm LV wall hypertrophy: Y/N

LV function: Normal **LV function depressed**: Mild/Moderate/Severe

Fractional Shortening %_____ **Ejection fraction %:** Visual _____Simpson biplane_____

Global Wall Motion Abnormalities(WMA's) : Y/N **Regional WMA's**: Y/N (*Indicate on diagram*)

Right Ventricle (RV):

RV dilated: Y/N **RV/LV diameter ratio** > 0.6: Y/N

RV global hypokinesis: Y/N **TAPSE**_____mm

Valves

Aortic Valve: Native/ normal Prosthetic Calcified Possible Vegetation

Colour Flow Regurgitation(AR): None **/**Mild/Moderate/Severe **AR Vena Contracta**:_____mm

Mitral Valve: Native/normal Prosthetic Annular calcification/leaflet calcification

Leaflets Flail/Prolapse Possible Vegetation

Colour Flow Regurgitation(MR): None/ Mild/Moderate/Severe

Tricuspid Valve: Normal Leaflets flail/prolapse Possible vegetation

Colour Flow Regurgitation (TR): None/Mild/Moderate/Severe Peak Velocity TR_____m/s

Pericardium

Pericardial Effusion**:** Y/N Max. diameter diastole: ____mm

RA diastolic collapse: Y/N RV diastolic collapse: Y/N IVC plethora: Y/N

Volume Status

LV PSAX: End systolic cavitary obliteration: Y/N

IVC : Diameter: _____mm Distensibility Index %:_____

Cardiac Output

LVOT diam. diastole_____mm LVOT VTI _____cm^2 Stroke Volume_____ml

Other

Ascending aorta: Normal/ Dilated/Flap **Intracardiac mass**: Y/N Pacing wire/PAC/ECMO cannula

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Summary findings:

_____

_____

Clinical Recommendations-

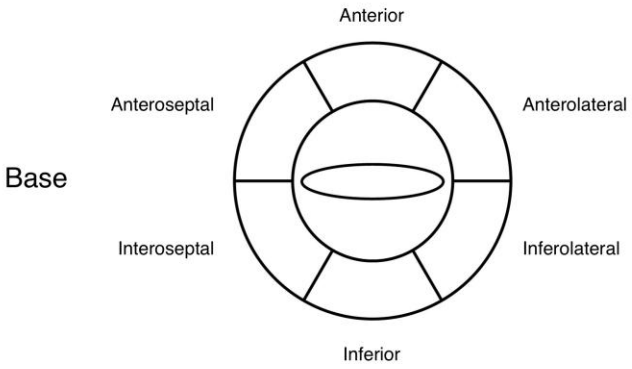
_____

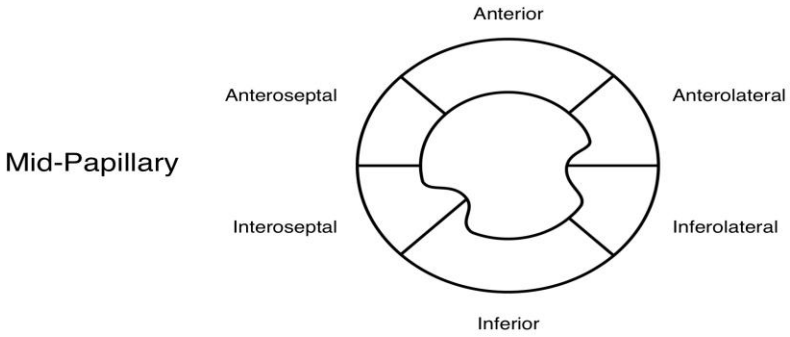
_____

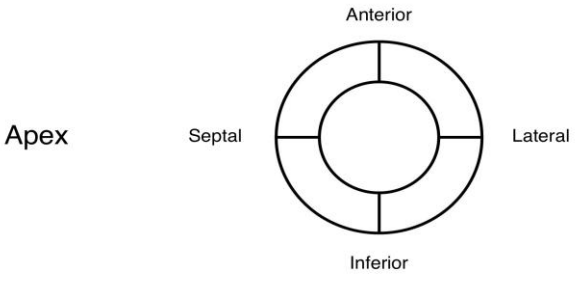
Trainee Signature:_____Supervisor Signature:_____

Date: ...../...../.....

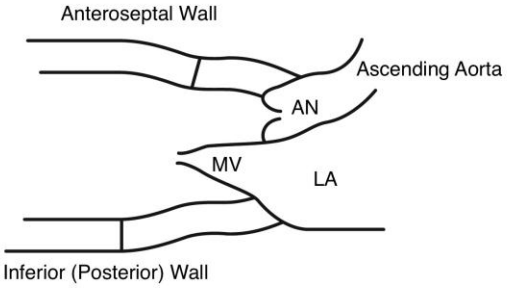
Parasternal Short Axis



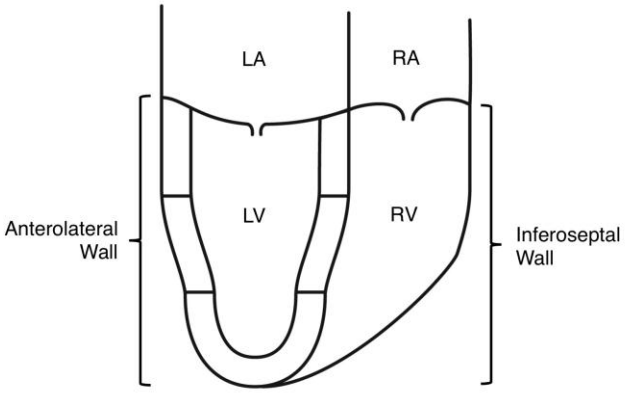




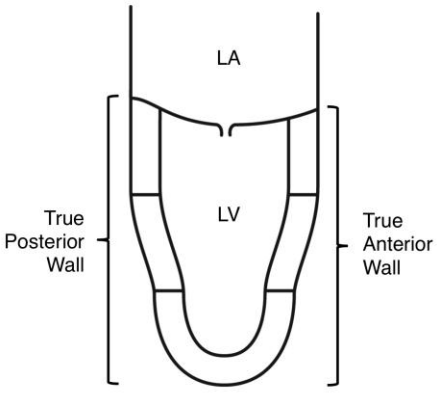
Parasternal Long Axis



Apical Views



Apical 4 - Chamber



Apical 2 - Chamber

Reference Data:

Left Ventricular End Diastolic diameter:

	Normal	Mildly dilated	Moderately dilated	Severely dilated
Men (cm)	4-**5.9**	6.0-6.3	6.4-6.8	>6.9
Women (cm)	3.9-**5.3**	5.4-5.7	5.8-6.1	>6.2

Fractional Shortening fraction %:

Normal **:** 25-45 Mild: 20-25 Moderate: 15-20 Severe: < 15

Ejection Fraction %:

Hyperdynamic LV function : > 65 Normal LV function: 55-60 Mild LV dysfunction: 45-54

Moderate LV dysfunction: 30-44 Severe LV dysfunction < 30

RVLV diameter ratio:

Apical 4 chamber view, end-diastole. Basal 1/3 of RV and LV, linear dimension

TAPSE:

Normal (mm) 24 ± 3.5 Abnormal < 17

AR Vena Contracta: > 6mm indicates severe AR

Tricuspid Regurgitation: Peak velocity > 3 m/sec indicates pulmonary hypertension.

Modified Bernoulli equation: 4 $(V)^2$ = 4 $(3)^2$ = 36 + CVP = Pulmonary artery systolic pressure (In the absence of pulmonary stenosis)

Volume Assessment:

IVC size: < 1cm fluid responsive IVC > 2.5 cm fluid non-responsive (*Feissel et al ICM 2004; 30:1834*)

Distensibility Index (DI) = IVC diam max. – IVC diam min./IVC diam mean (*Barbier et al ICM 2004; 30: 1740*)

DI % > 12 indicated fluid responsiveness

Calculations